

Embedded System I

Final exam single projects

Mode

Students must do a project, writing design sheet and code, implement them on an SBC, do tests & docs.

Base evaluation is 24/30 points, student can increase score explaining his choices and his contribution to a project. Each student single or two-coupled must write code and a series of documents.

Exam will be done executing in front to commission test designed and discuss design choice.

I2C – SPI Monitor

- A I2C - SPI (or both) monitor to debug, displaying data locally on LCD Display and send all traffic to host PC (Serial.print)
- System must be passive, only capture data
- Switch to SPI – I2C can be done via mechanical switch or mini keyboard
- A button for display snapshot required
- A file log (Serial.print) to PC hosting board connected is required, writing file with CMD STDOUT redirection (“>”)¹

Battery Tester

- Two button UP-Down to set range, LCD Displayed, changing do a clear measure
 - 1.2 V
 - 1.5 V
 - 2.5 V
 - 3.0 V
 - 3.6 V
- Clear measure, start again when measure ≤ 0
- Two LED
 - Green -> OK
 - Red -> NOK
- Yellow LED for alarm
- Measure, logged on LCD; must be stabilized and displayed up to 1 sec delay
- A switch for set tolerance 1% or 5%

Optimal Climate Control

- 1 Temperature Sensor IN
- 1 humidity sensor IN
- 1 Vaporizer Unit OUT ON-OFF (LED simulated)
- 1 Heating Unit OUT ON-OFF (LED simulated)
- 1 Cooling Unit OUT ON-OFF (LED simulated)
- Display
- 2 Temperature set buttons
- 1 ON-OFF switch and indicator LED

¹ If a board with SD card disk was used, write log file also here.

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- Logic
 - Relative Humidity optimal 45-55%
 - HI out of range -> Cooling ON
 - LOW out of Range -> Vaporizer ON
 - ELSE Cooling & Vaporizer OFF
 - Temperature optimal = requested by user ± 0.5 °C
 - HI out of range -> Heating OFF
 - If after 1 min not yet in set Cooling ON
 - LOW out of range -> Heating ON
 - ELSE Heating & Cooling OFF

To obtain a best exam evaluation, humidity can be set by two buttons from 25 to 95% (greenhouse control)

Infrared Theremin

- 2 Obstacle Avoidance Sensor
 - 1 horizontal for left hand – volume control
 - 1 vertical & angle adjustable for right hand – frequency control
- 1 switch ON-OFF
- 1 switch Glissato-Normal
 - Normal out only frequency corresponding to Piano notes (distance for right hand is step measured)
 - Glissato out frequency proportional to distance resolution
- Logic is self explanatory

To obtain a best exam evaluation, can be added:

1. vibrato control
2. wave choice
 - a. Sinusoidal
 - b. Triangular
 - c. Square (fixed duty factor)

For “Laude” a MIDI Out can added via Serial.print or MIDI interface if available